FORM PTO-1390 (Modified) (REV 11-98) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: **JMYT-223US**

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.5): To be Assigned 09/623447

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/GB99/00626	**3 March 1999 (03.03.99)**	**6 March 1998 (06.03.98)**

TITLE OF INVENTION

IMPROVEMENTS IN EMISSIONS CONTROL

APPLICANT(S) FOR DO/EO/US

Guy Richard CHANDLER, and Martyn Vincent TWIGG

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☒ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☒ Certificate of Mailing by Express Mail
20. ☐ Other items or information:

534 Rec'd PCT/PTO 05 SEP 2000

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/623447 To be assigned	PCT/GB99/00626	JMYT-223US

21. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

		CALCULATIONS PTO USE ONLY
☐	Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO and International Search Report not prepared by the EPO or JPO	$970.00
☒	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but Internation Search Report prepared by the EPO or JPO	$840.00
☐	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	$690.00
☐	International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)	$670.00
☐	International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4)	$96.00

ENTER APPROPRIATE BASIC FEE AMOUNT = **$840.00**

Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)). **$0.00**

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	13 - 20 =	0	x $18.00	$0.00
Independent claims	3 - 3 =	0	x $78.00	$0.00
Multiple Dependent Claims **(check if applicable).**			☐	$0.00

TOTAL OF ABOVE CALCULATIONS = **$840.00**

Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) **(check if applicable).** ☐ **$0.00**

SUBTOTAL = **$840.00**

Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). + **$0.00**

TOTAL NATIONAL FEE = **$840.00**

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).** ☐ **$0.00**

TOTAL FEES ENCLOSED = **$840.00**

Amount to be: refunded	$
charged	$

☒ A check in the amount of **$840.00** to cover the above fees is enclosed.

☐ Please charge my Deposit Account No. in the amount of to cover the above fees.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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NAME

36,201
REGISTRATION NUMBER

September 5, 2000
DATE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Guy R. CHANDLER et al.	: Art Unit:	To Be Assigned
Serial No.:	To Be Assigned	: Examiner:	To Be Assigned
Filed:	HEREWITH	:	
For:	IMPROVEMENTS IN EMISSIONS CONTROL	:	

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

S I R :

Prior to examination, please amend the above-identified application as follows.

IN THE SPECIFICATION:

On page 1, after the title, please insert the following sentence.

--This application is a U.S. National Phase application of PCT International Application No. PCT/GB99/00626.--

Page 3, line 5, change "actalysts" to --catalysts--.

IN THE CLAIMS:

Please amend the claims as follows:

1. (Amended) An emission control exhaust gas aftertreatment apparatus for exhaust gases from diesel engines [, especially light duty diesel engines,] comprising a source of NO_2, [and] a particulate trap, [characterised in that] and an exhaust gas by-pass [is provided so that], wherein a portion of the exhaust gases do not pass through the trap, such that at most 85% of engine-out particulates are collected on the trap and combusted in the presence of said NO_2 in said trap.

4. (Amended) An apparatus according to claim 2 [or 3], wherein the source of NO_2 is a catalyst which is effective to convert at least a portion of the NO in the exhaust gases to NO_2.

6. (Amended) An apparatus according to claim 1 [any one of the preceding claims], arranged such that at least 50wt% of particulate matter is trapped and subsequently combusted when operating conditions in the same or subsequent operating cycle are improved.

7. (Amended) An apparatus according to claim 1 [any one of the preceding claims], in combination with NOx control means [, preferably a NOx absorbent].

8. (Amended) An apparatus according to claim 13 [7], wherein said NOx absorbent is effective to trap NOx at relatively low exhaust gas temperatures, and releases NOx when the exhaust gas temperature exceeds about 250°C for conversion [and/or] or consumption in the combustion of particulate matter.

9. (Amended) A method of controlling emissions [, especially particulate matter,] from diesel engine exhaust gases by trapping and subsequently combusting said particulate matter, comprising trapping at most 85wt% of particulate matter in said exhaust gas in particulate trapping means and combusting said trapped particulate matter in the presence of NO_2 and causing a portion of said exhaust gases to by-pass said particulate trapping means.

Please add the following new claims:

11. (Newly added) An emission control exhaust gas aftertreatment apparatus for exhaust gases from light duty diesel engines comprising a source of NO_2, a particulate trap, and an exhaust gas by-pass, wherein a portion of the exhaust gases do not pass through the trap, such that at most 85% of engine-out particulates are collected on the trap and combusted in the presence of said NO_2 in said trap.

12. (Newly added) An apparatus according to claim 3, wherein the source of NO_2 is a catalyst which is effective to convert at least a portion of the NO in the exhaust gases to NO_2.

13. (Newly added) An apparatus according to claim 7, wherein said NOx control means is an NOx absorbent.

Respectfully submitted,

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CRL/nr

Dated: September 1, 2000

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The Assistant Commissioner for Patents is hereby authorized to charge payment to Deposit Account No. **18-0350** of any fees associated with this communication.

EXPRESS MAIL Mailing Label Number: EL512197290US
Date of Deposit: September 5, 2000

I hereby certify that this paper and fee are being deposited, under 37 C.F.R. § 1.10 and with sufficient postage, using the "Express Mail Post Office to Addressee" service of the United States Postal Service on the date indicated above and that the deposit is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

Kathleen Libby

AA 1395

IMPROVEMENTS IN EMISSIONS CONTROL

The present invention concerns improvements in emission control, and more especially it concerns the control of emissions from diesel engines.

Diesel engines fall into two main categories, namely heavy duty, being principally large engines for trucks, buses and prime mover vehicle engines, ships and boats and stationary engines, and light duty engines, used in smaller trucks and cars. With the increasingly demanding regulation of emissions from all sorts of engines, attention is now being paid to control of emissions such as particulates and NOx from diesel engines. We have, in EP 341,832, described a device marketed as the Continuously Regenerating Trap ("CRT™") by Johnson Matthey. This device traps sooty particulates and causes their combustion by exposing them to NO_2 generally generated by catalytically oxidising NO present in the exhaust stream. This device has met with considerable success in controlling particulate emissions from heavy duty diesel engines, and can achieve zero emissions of particulate. That is, the CRT as marketed is approximately 100% effective to remove particulates (as defined in the regulations).

We have realised that a conventional CRT may not be cost-effective to control emissions to European Stage III, IV, or higher, regulations from light duty engines. A number of different options for controlling particulates and NOx are available, and engine manufacturers have hitherto favoured engine design and management solutions. In general, engine design itself can satisfy European Stage II emissions standards as regards NOx and particulates, but the characteristics of the diesel engine are such that engine design cannot improve upon about 0.4g/Km particulates without a serious increase in NOx, which is difficult to deal with under lean conditons. There still remains, therefore, a need for effective systems to meet these emission regulations whilst increasing engine design options.

EP 0759713 (Toyota) describes an addition to the CRT principles, involving the absorption in a NO_x absorbent of NO from gases leaving the CRT-type combination of oxidising catalyst and diesel particulate filter or trap, formed by one of the reactions of NO_2 with carbon particles.

The present invention provides an emission control exhaust gas aftertreatment apparatus for diesel engines comprising a source of NO_2, especially an oxidation catalyst effective to convert a portion of NO in the exhaust gas from said diesel engine into NO_2, and a particulate trap characterised in that an exhaust gas by-pass is provided so that a portion of the exhaust gases do not pass through the trap, such that at most 85% by weight of total engine-out particulates are collected and combusted in the presence of said NO_2 in said trap. According to various embodiments of the present invention, the quantity of particulates collected and combusted may be at most 85%, 60% or at least 50% by weight. It is, however, important that all particulates collected are combusted (over several operating cycles, but not necessarily over a single operating cycle), in order to avoid accumulation and blocking of the filter. The presence of the by-pass alleviates build-up of back pressure with consequent degradation of engine performance.

The by-pass may permit a portion of the exhaust gases to escape the trapping means either continuously or when substantial trapping of unburnt particulates has occurred. Desirably, the trapping means is designed to be "fail-safe", that is whilst it is effective to capture 50wt% or more of sooty particulates under normal conditions, the trapping means decreases its collecting efficiency whether by exhaust gases by-passing the trapping means or otherwise, if the collecting means becomes "saturated" or clogged up. This concept is, we believe, new in diesel exhaust treatment systems.

The invention accordingly provides a method of controlling emissions, especially particulate matter, from diesel engine exhaust gases by trapping and subsequently combusting said particulate matter, comprising trapping at most 85wt% of particulate matter in the presence of NO_2, and causing a portion of said exhaust gases to by-pass said particulate trapping means.

The source of NO_2 is especially conveniently an oxidation catalyst of generally known type, capable of converting at least a portion of the NO contained in diesel exhaust gases into NO_2. However, the present invention includes within its scope variations including other sources of NO_2. Such sources could include compressed NO_2, other

chemical sources which decompose or react, possibly over a catalyst, to yield NO_2, such as nitric acid, ammonia, urea, etc. The invention includes within its scope all ways of making NO_2 from the components of the exhaust gases. These may include: adding one or more catalytic components to the fuel, so that the components deposit on exhaust components including the filter; catalysing the filter or parts thereof with actalysts active at low temperatures to convert NO to NO_2; utilising a plasma to generate NO_2 by treatment of all or a portion of the exhaust gases, and other methods available to the skilled person.

In the invention, the particulate trap, or trapping means, is designed to be less than 100% effective, and desirably this brings several advantages, the first of which is considerably reduced back pressure. Light duty diesels are very much less capable of coping with back pressure from exhaust gas systems than heavy duty diesels, because they tend to be of smaller capacity and power, and in extreme cases the engine can be ruined.

The present invention is also intended to cater for some of the problems that can arise in practical usage of light duty diesels. If such engines are used in small cars or vans which are used at low speeds in towns for large portions of their operations, the exhaust gas temperature tends to be quite low, perhaps not more than 100-120°C. Under these conditions, although sooty particulates are generated in less quantities than under heavy load, the temperature is below that for the most efficient oxidation of NO to NO_2 and hence there can be insufficient NO_2, or the reaction temperature is too low for effective combustion of the sooty particles. Accordingly, for many vehicles for much of the time, the trapping means should collect sufficient of the particles to meet the emission regulations, but using a design that collects such particulates for subsequent combustion when conditions are improved, and permits the exhaust gas to pass through without excessive back pressure. In such systems, at least 50wt% of particulate matter is trapped and subsequently combusted when operating conditions in the same or subsequent operating cycles are improved.

It will be recognised that the prime purpose of the invention is to remove a proportion only of the particulates from the exhaust gas stream. This is intended to be adequate to meet the appropriate emission regulation when combined with engine design and

management improvements. The reduced efficiency in collection of particulates of the present invention brings about a significant reduction of cost, however, from a reduced volume and weight for both the catalyst and the trap compared to the state of the art CRT designed for such an engine.

The oxidation catalyst may be any that is effective to convert sufficient NO to NO_2, and is suitably a high platinum loading catalyst carried on a ceramic or metal honeycomb catalyst support. It is envisaged that in addition to reducing volume and weight of the catalyst, savings may be made in precious metal loading, thus reducing the cost yet further.

The particulate trap may suitably be a woven or knitted wire mesh or perforated metal or a suitable ceramic material. Preferred traps include especially those known as wall flow filters. The trap is suitably designed for each individual engine design, because the particulate emissions differ significantly from engine to engine. The trap may, but need not, carry a catalytic coating intended to initiate combustion at lower temperatures.

Continuing development of the inventive concept of the present invention has led to studies of flow and pressure patterns within such exhaust treatment systems. A further embodiment of the invention, in which the trap has peripheral bypass through which the exhaust gases flow only when the central portion of the trap becomes blocked, is particularly preferred. The flow of the gases can be directed to the central portion by a variety of means, including particularly baffle plates or cones, metal lips and the like, but we have found that extending the catalyst in the peripheral area is particularly simple and effective to reduce gas flow rates in that region.

A preferred embodiment of the present invention combines the emission control system with NOx control means. The NOx control may be achieved in a number of ways including exhaust gas recirculation, using a NOx conversion catalyst downstream of the trap or, more preferably, combining the trap system with a NOx absorbent. Such NOx absorbents are known to those skilled in the art and may utilise an alkaline earth metal oxide such as baria or calcia or other suitable materials. Together with the trap system of the

present invention, such an absorbent can permit extremely useful control of emissions, for example up to about 80% removal of particulates combined with up to about 80% removal of NOx. The NOx trap is desirably a single through-flow canister, which may be regenerated by periodic enrichment of the exhaust gas in a number of ways. In an even more preferred embodiment, the trap system of the invention is combined with a lean-NOx catalyst and a NOx trap. A particularly desirable embodiment is where the NOx trap is effective to trap the NOx at low temperatures and releases NOx at higher temperatures, *eg* about 250°C, at which temperatures NOx may more readily be converted and/or used in the particulate combustion of the present invention.

When using the presently-preferred platinum-based catalyst, the present invention should be used with fuel of not more than 50ppm sulphur, and preferably below 50ppm sulphur, more preferably below 10ppm sulphur. Other catalyst systems may have a wider range of fuel sulphur levels.

The invention may be better appreciated by reference to the accompanying drawings, in which:

Figure 1 is a schematic cross-section of a first embodiment of the invention,

Figure 2 is a schematic cross-section of a second embodiment of the invention, and

Figure 3 is a schematic cross-section of a further embodiment of the invention, and

Figure 4 is a schematic cross-section of a yet further embodiment.

Referring to Figure 1, a canister is to be mounted in the exhaust system of a light duty diesel, *eg* a 1.9 litre Tdi engine. The canister, 1, contains an oxidation catalyst, 2, which is a platinum catalyst carried on a 100cells/sq in metal honeycomb substrate. Particulate passes through the catalyst. A perforated gas distributor, 3, is mounted downstream of the catalyst, and surrounding the gas distributor is a sintered stainless steel filter, 4, which is located centrally within the canister. It can be seen that it is possible for the exhaust gases to by-pass the filter if the filter becomes clogged. Under ideal conditions, the filter collects sooty particles which are continuously combusted in the NO_2 generated by the catalyst, according to one or more of the equations:

$$NO_2 + C \rightarrow NO + CO$$
$$2NO_2 + C \rightarrow 2NO + CO_2$$
$$2NO_2 + 2C \rightarrow N_2 + 2CO_2$$
$$NO_2 + O_2 + C \rightarrow 2NO + CO_2$$

Under non-ideal conditions, that is at low exhaust gas temperatures, a portion only of the particulate is collected in the filter, and most of the exhaust gas by-passes the filter. Returning to higher exhaust gas temperatures permits the combustion reaction to re-start and the particulate can be totally removed from the filter.

Referring to Figure 2, an embodiment is shown which permits substantial accumulation of particulate without by-pass, but using a filter, 5, which is not 100% effective. The same items as in Figure 1 are identified using the identical reference numerals. There is sufficient capacity to accumulate particulate under all normal operating conditions.

Figure 3 utilises a slightly different by-pass design to that of the embodiment of Figure 1. The particulate is collected by impingement on a baffle plate, 6, and is shown by mass, 7. The baffle plate is itself preferably porous to gas and acts as a filter. As exhaust gas temperatures rise, the hot gases immediately contact the collected particulate and quickly cause combustion. This design may comprise electrical heating of the collection area on plate 6, creating a hot spot to initiate combustion. In a further design variation the baffle plate may comprise upstanding walls, giving a U-shaped cross-section.

A preferred embodiment is illustrated in Figure 4. Engine exhaust gas passes through catalyst 2, which is provided with a peripheral lip 2a. The resulting increased resistance to flow in the peripheral region causes the majority of the gases to flow through the central, filtering, region of trap 4, (4a) rather than through the open peripheral bypass region (4b). Thus under normal operating conditions, negligible quantities of the exhaust gases bypass the filter, but if the filter becomes blocked with particulate, the system is fail-safe and the gases bypass the filter. Surprisingly low back pressures result from this system.

The above Figure 4 embodiment was tested fitted to a commercially available 1.9 litreTdi car designed to meet European Stage II standards. After 1,000 road miles, the embodiment was tested according to the European Stage III test protocol. The following test results were obtained:

	HC (g/Km)	CO (g/Km)	NO_x (g/Km)	PM (g/Km)
Engine-out exhaust gas	0.21	0.69	0.65	0.10
With Fig 4 by-pass filter	0.02	0.03	0.62	0.02

It is to be noted that these results meet Stage IV requirements also, with the exception of NO_x. However, established engine design/management techniques can be used to lower NO_x emissions to Stage IV levels, with a consequent increase in Particulate Matter, but the system of the invention is capable of dealing with such emissions.

It will be appreciated that there are many possibilities to vary the designs shown herein without departing from the principles of the present invention.

CLAIMS

1. An emission control exhaust gas aftertreatment apparatus for exhaust gases from diesel engines, especially light duty diesel engines, comprising a source of NO_2 and a particulate trap, characterised in that an exhaust gas by-pass is provided so that a portion of the exhaust gases do not pass through the trap, such that at most 85wt% of engine-out particulates are collected on the trap and combusted in the presence of said NO_2 in said trap.

2. An apparatus according to claim 1, wherein said by-pass is effective only when substantial trapping of unburnt particulates has occurred.

3. An apparatus according to claim 1 wherein said by-pass is effective under all operating conditions and at least 50wt% of particulate matter is trapped and combusted.

4. An apparatus according to claim 2 or 3, wherein the source of NO_2 is a catalyst which is effective to convert at least a portion of the NO in the exhaust gases to NO_2

5. An apparatus according to claim 4, wherein the exhaust gases pass through the catalyst before passing through the trap.

6. An apparatus according to any one of the preceding claims, arranged such that at least 50wt% of particulate matter is trapped and subsequently combusted when operating conditions in the same or subsequent operating cycle are improved.

7. An apparatus according to any one of the preceding claims, in combination with NOx control means, preferably a NOx absorbent.

8. An apparatus according to claim 7, wherein said NOx absorbent is effective to trap NOx at relatively low exhaust gas temperatures, and releases NOx when the exhaust gas temperature exceeds about 250°C for conversion and/or consumption in the combustion of particulate matter.

9. A method of controlling emissions, especially particulate matter, from diesel engine exhaust gases by trapping and subsequently combusting said particulate matter, comprising trapping at most 85wt% of particulate matter in said exhaust gas in particulate trapping means and combusting said trapped particulate matter in the presence of NO_2 and causing a portion of said exhaust gases to by-pass said particulate trapping means.

10. A method according to claim 9, comprising using an exhaust gas by-pass such that at least 50wt% of particulate matter is collected and combusted, and the exhaust gas by-pass is effective only when there is complete or substantial blocking of the trap.

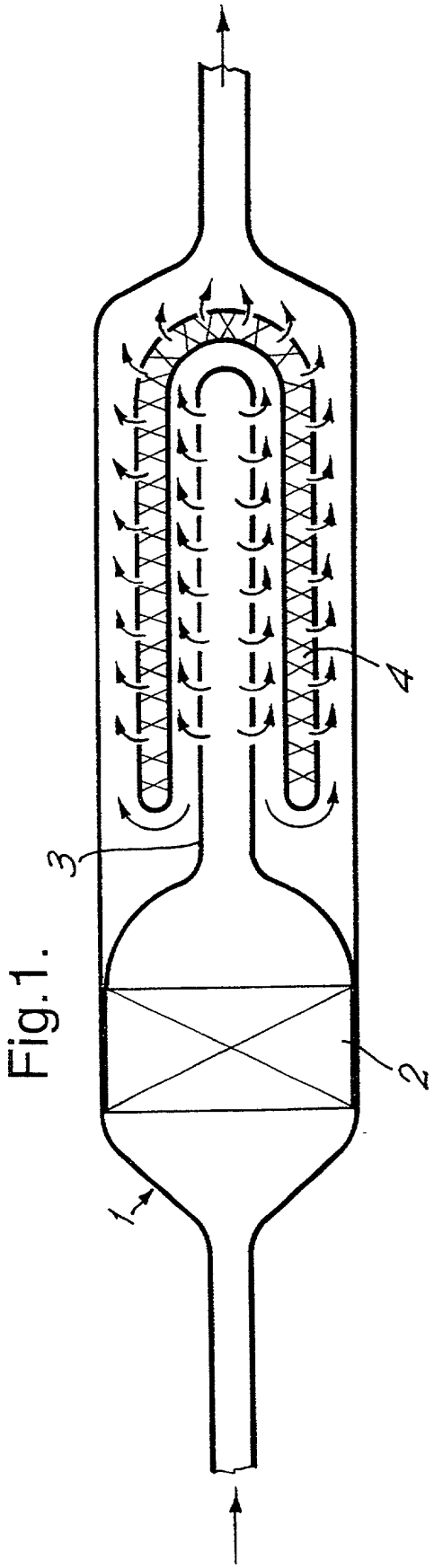

Fig.1.

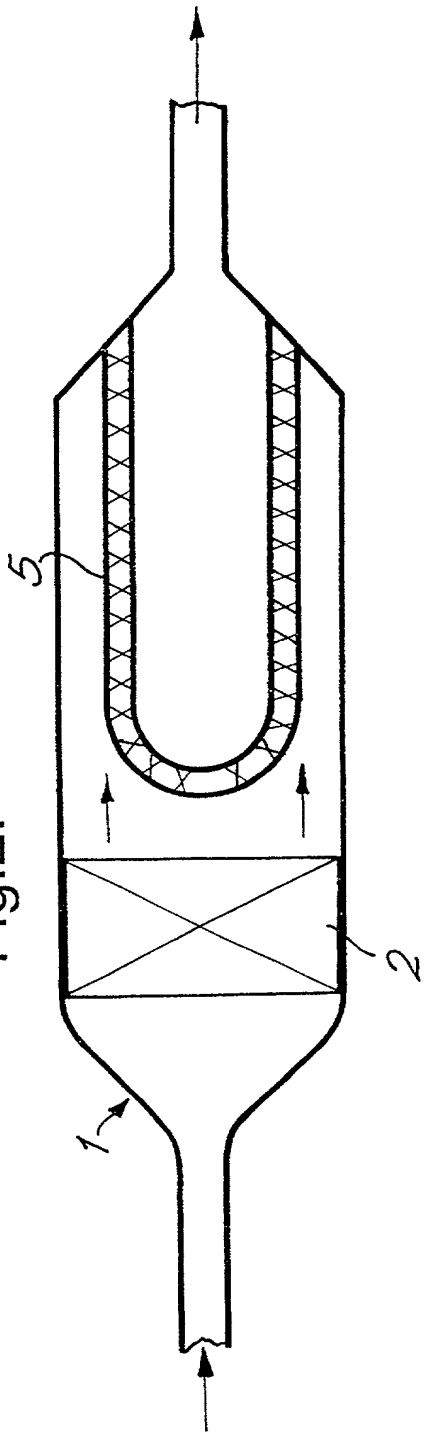

Fig.2.

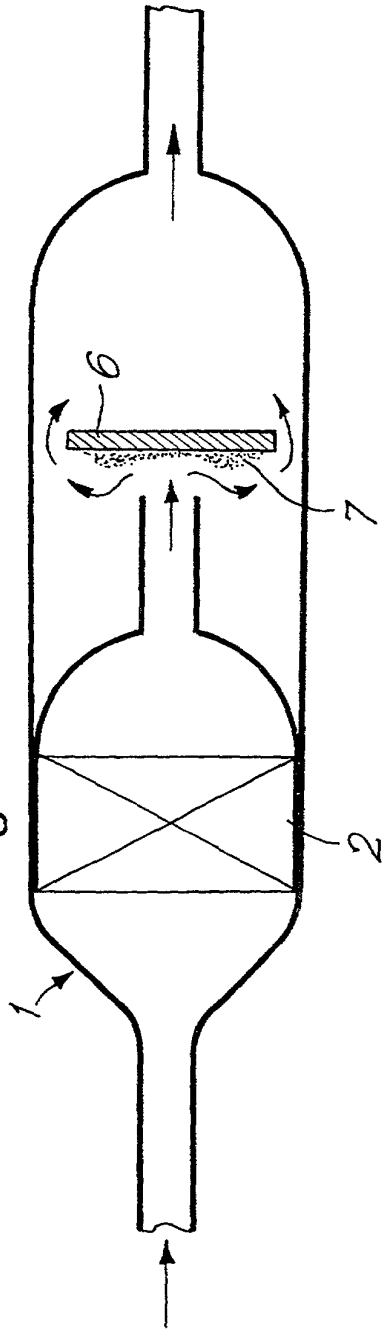

Fig.3.

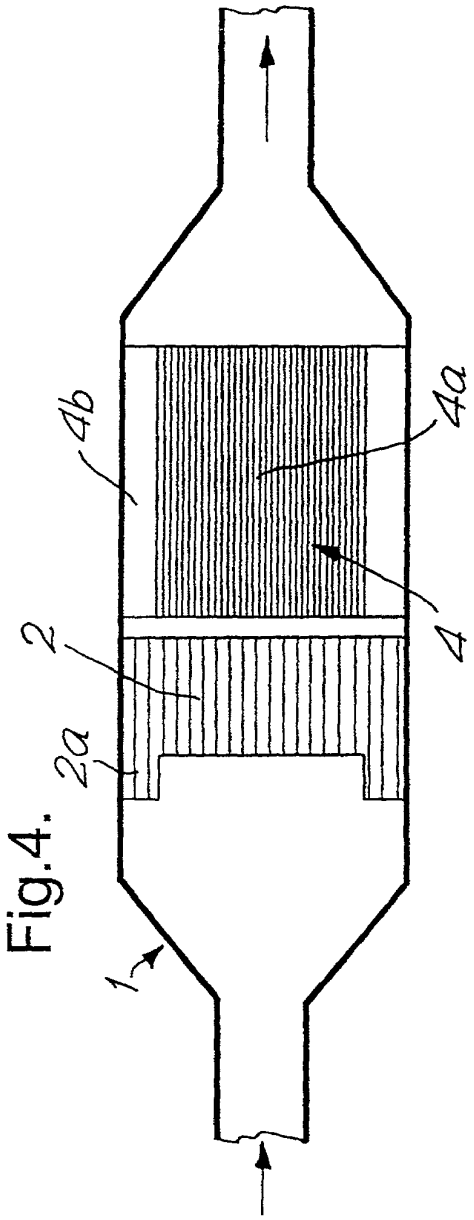

Fig.4.

Declaration and Power of Attorney For Patent Application
English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled
IMPROVEMENTS IN EMISSIONS CONTROL ,
the specification of which is attached hereto unless the following box is checked:

☒ was filed on 5 September 2000 as
United States Application Number or PCT International Application Number 09/623,447
and was amended on September 5, 2000 (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Not Claimed
9804739.2	Great Britain	6 March 1998	
(Number)	(Country)	(Day/Month/Year Filed)	☐
—	—	—	
(Number)	(Country)	(Day/Month/Year Filed)	☐

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below.

—	—
(Application Number)	(Filing Date)
—	—
(Application Number)	(Filing Date)

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

09/674145
01 Rec'd PCT/PTO 13 DEC 2000

(Application Number)	(Filing Date)	(Status - patented, pending, abandoned)
(Application Number)	(Filing Date)	(Status - patented, pending, abandoned)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

Paul F. Prestia	Reg. No. 23,031	Lawrence E. Ashery	Reg. No. 34,515	Jack J. Jankovitz	Reg. No. 42,690
Allan Ratner	Reg. No. 19,717	Christopher R. Lewis	Reg. No. 36,201	Jonathan H. Spadt	Reg. No. 45,122
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Kevin R. Casey	Reg. No. 32,117	Daniel N. Calder	Reg. No. 27,424		
Benjamin E. Leace	Reg. No. 33,412	Louis W. Beardell, Jr.	Reg. No. 40,506		
James C. Simmons	Reg. No. 24,842	Jacques L. Etkowicz	Reg. No. 41,738		

TB

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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☐ Additional inventors are being named on separately numbered sheets attached hereto.